Keynote speech on

Green products and Services in Indian Markets

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President, International Society of Waste Management, Air and Water (ISWMAW)
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International Conference on “the Green Consumption & Green Procurement Green Trade Project Office, Ministry of Economic Affairs, Taiwan

On 26th March 2013 at Taipei, Taiwan
Today’s Agenda

- Introduction
- Categories of Green products & services
- Taiwan’s share in green product
- Evolution - Concept Green Products
- How to make Products & Services Green
- Scope of GPS Business in India
- Top 20 Green Products
- Green Building
- Cases
- Conclusion
• With the award of the Distinguished Visiting Fellow by the Royal Academy of Engineering, UK worked on ‘Energy Recovery from Municipal Solid Waste’ in 2012.

• Awarded subsequently two times the UKIERI Research Project as India Leader with UK partNER – in 2011 on

  • A) “Climate Change Issues and Environmental Performance of Small and Medium-sized Enterprises (SMEs) in India and the UK” for 2012 - 2014 and Research Project – in 2013 on

Areas of research are TQM, ISO Standards, Waste Management, Recycling, Carbon Footprints and Climate change, Jute Ribboning, Education and Training, Self Help Group activities, Performance Improvement, Project Management & Engineering, Vendor Management, etc. His areas of interest include Assessment of Procurement System, Quality Assurance & inspection, and automobile engineering.

Procurement of Vehicles in the dept. of Fire & Emergency Services, Govt. of West Bengal in 2013.
Patent on “eco-friendly plastics recycling” and another is awaited for his machines & processes” & one awaited on “Automatic High Speed Jute Ribboning Machine” innovated.

“Indian Congress on Quality, Environment, Energy and Safety Management Systems” and

“International Society of Waste Management, Air and Water”.

Introduction

Green products are those that have less impact on the environment or are less detrimental to human health. Green products might, typically, be formed or part-formed from recycled components, be manufactured in a more energy-conservative way, or be supplied to the market with less packaging (or all three).

The term is used to describe a product that meets one of these criteria.

1. Qualities that will protect the environment.
2. Replace artificial ingredients with natural ingredients.
Green goods and services fall into one or more of the following five categories:

1) **Energy from renewable sources.** Electricity, heat, or fuel generated from renewable sources. These energy sources include wind, biomass, geothermal, solar, ocean, hydropower, and landfill gas and municipal solid waste.
2) Energy efficiency.

Products and services that improve energy efficiency. Energy-efficient equipment, appliances, buildings, and vehicles, as well as products and services that improve the energy efficiency of buildings and the efficiency of energy storage and distribution, such as Smart Grid technologies are included in this group.
3) Pollution reduction and removal, greenhouse gas reduction, and recycling/reuse. They,

- **Reduce** or eliminate the creation/release of pollutants/toxic compounds, or remove pollutants or hazardous waste from the environment.

- **Reduce** greenhouse gas emissions through methods other than renewable energy generation and energy efficiency, such as electricity generated from nuclear sources.

- **Reduce** or eliminate the creation of waste materials; collect, reuse, remanufacture, recycle, or compost waste materials or wastewater.
4) **Natural resources conservation.**

Products and services that conserve natural resources. Products and services related to organic agriculture and sustainable forestry; land management; soil, water, or wildlife conservation; and storm water management are included in this group.
5) Environmental compliance, education and training, and public awareness. They,

- **Enforce** environmental regulations.
- **Provide** education and training related to green technologies and practices.
- **Increase** public awareness of environmental issues.
# TAIWAN’S SHARE IN GREEN PRODUCT

## Taiwan’s Main Export Markets and Export Values (US$m)

<table>
<thead>
<tr>
<th>Export market</th>
<th>September 2012</th>
<th>January-September 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Export value</td>
<td>Proportion of total value</td>
</tr>
<tr>
<td>China plus Hong Kong</td>
<td>10,843</td>
<td>39.9%</td>
</tr>
<tr>
<td>US</td>
<td>2,904</td>
<td>10.7%</td>
</tr>
<tr>
<td>Europe</td>
<td>2,271</td>
<td>8.4%</td>
</tr>
<tr>
<td>Japan</td>
<td>1,864</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

*Export value minus import value

Source: MOF, compiled by Digitimes, October 2012
Evolution - Concept Green Products

- **1962** – Silent Spring by biologist Rachel Carson detailed and questioned the extensive spraying of DDT, a pesticide, without understanding the environmental impacts or effects on humans and wildlife.
- **1970** – Formation of the Environmental Protection Agency
- **1972** – The use of DDT as a pesticide was banned in the US.
- **1978** – CFC’s were banned from aerosol cans due to their effect on ozone depletion.
- **1980’s** – String of products were released that carried the labelling “Environmentally Friendly.” But no regulations in place for determining if a product was really environmentally friendly.
- **1989** – Green Seal, an independent, non-profit body for developing certifications and standards for environmentally friendly products was formed.
- **1992** – Bill Clinton signed Executive order 13101, defining “green cleaning” and forcing roughly 100,000 organizations to switch to green alternatives.
- **1995** – Formation of the Environmental Choice Program, another regulatory body that helps create standards for Green Products.
- **1996**: Release of ISO 14001 standard
- **2000** – Bill Clinton signs Executive order 13148, expanding the scope of Executive order 13101.
- **2005** – Washington becomes the first state to enact Green Building legislation – an environmentally responsible method for designing, operating, maintaining, and demolishing buildings and structures.
- **2006** – New York requires the use of green products in all public & private schools.
Green Product Navigator

- Entrance
- Support Programs
- Cleaning Chemicals
- Water Use Reduction
- Site Maintenance
- Paper Products
- Recycling
- Plastic Liners
- Workplace Wellness
- Cleaning Tools
How to make Products & Services Green

The green products and services (GPS) are not stand alone process. It needs to start from the conceptual stage and through all the steps e.g.,

- Concept
- Design
- Selection of Vendors & GSCM
- Manufacturing
- Recycling & Reverse logistic
- Packing
- Transport with least distance
- Services
- Disposal
- Redesign
- LCA & reducing
- Carbon Footprint
Closed loop supply chain of a manufacturing company

Other energy sources → Energy → Energy from waste

Supplier inputs → Inbound logistics → Production

Outbound logistics → Quality Output to Customers

Reverse Logistics → Disposal

For reuse of components → For remanufacturing

Waste
How to make Products & Services Green

- Design considering end-of-the-life & LCA,
- Materials selection, suppliers selection & GSCM adoption,
- Manufacturing rather green manufacturing,
- Recycling and reverse logistic, Packaging,
- Transport within the manufacturing unit and beyond,
- servicing,
- disposal considering reduction of carbon footprints.

In India there is huge market for green products and green services with new legislations, pressure from stakeholders and international treaties and conventions. Here I have discussed some of the areas of business where green products are the need of the decade.
Scope of GPS Business in India

- Rapid growth - 2002-2011, GDP 8% and estimated same for 2012-2017
- Hub for research and development for green solutions
  - World’s third largest pool of scientists and engineers,
  - Innovation in technology,
  - Low-priced manufacturing and services, (e.g) significant achievements in information technology, professional services and communications
  - Traditional knowledge and processes
  - Green innovation and high amount of venture capital is flowing (e.g) 3rd attractive country for renewable energy investment.
• Limited resources, social responsibility, competition, cost reduction (recycle, reuse)
• Consumers and employees are becoming increasingly conscious of env. issues
• National policies to promote green business
  - NAPCC, ECBC, energy conservation building code 30-40% reduction of energy), Solar Mission, Clean Energy Funds, REC-renewable energy certificate & energy efficiency certificate trading scheme, Corporate Social Responsibility Practices, publicity through media TV such as ‘Save the Environment’, ‘light the billion’ NGOs create awareness of being green.
Govt. support hybrid and electric vehicles, opt policies which reduce of harmful goods-democratic, MUD promote green travel- bicycle scheme, shift towards public transport, electric vehicles, buy back used electric products, bio-fuel blending

- International carbon markets (CDM) (carbon credits
- Wind power, biomass, hydropower, use of waste heat, energy efficiency, biogas, avoidance of GHGs, afforestation and reforestation, transportation, etc,)
- CII, confederation of Indian industry encourages green business in all sectors
- The climate disclosure project WARNS of negative growth without GB.
Top 20 Green Products

1) solar energy, 2) recycled paper, 3) recycled glass, 4) recycled tin, 5) rain water which is stored and purified, 6) recycled plastic, 7) bio fertilizers, 8) wind energy, 9) geothermal energy, 10) recycled steel, 11) biodiesel, 12) biogas, 13) water heated by using solar water heater, 14) emergency light which runs on solar energy, 15) recycled mobile, 16) biomass and biogas plant, 17) gasohol, 18) natural gas, 19) equipments, consuming less energy, 20) engines emitting less amount of gas.
HERBAL HERO

Maa Danteshwari Herbal Products,
Kondagaon, Chhattisgarh

Rajaram Tripathi 49

From banking to farming

Rajaram Tripathi has created a niche through organic herbal farming in over 1,000 acres land in his home district Kondagaon in Chhattisgarh. He quit his job as a bank officer in 2001 to take up farming. Tripathi received the prestigious Earth Hero Award 2012, instituted by Royal Bank of Scotland for biological diversity.

Organic benefits

Tripathi felt the prime reason why farmers had mounting debts was because of wasteful expenditure on pesticides and fertilisers. His group uses organic fertilisers made of farm waste, including leaves and cow dung. His farms use bio-waste generated power. The group, comprising 200 tribal families, markets its produce with the help of Central Herbal Agro Marketing Federation of India. They have set up a herbal food supplement production unit and have an annual turnover of Rs 20 crore.

by Lemuel Lall
NATURAL KHADI

MINC retail store, Bangalore
Mini Varkey Shibu

Ethnic is chic
Mini believes in “khadinomics”. Along with husband Kochery C. Shibu, who works with a hydraulics company in Himachal Pradesh, Mini, an NID graduate, started her first retail store for eco-friendly fashion clothing in December 2007 in Bangalore. The store is called MINC, short for ‘mini’ couture. The intention, as a poster-photograph in the store proudly proclaims, is to “initiate young users to eco-friendly clothing and the value of our rich heritage in fabric.”

No compromise on quality
All the fabric used in Mini’s store is organic and sourced from tribals of Dharmapuri district in Tamil Nadu. Chemical fertilisers are a strict no-no. The cotton is hand-spun under specific instructions. While she mainly uses vegetable dyes, Mini has also opted for ammonia-free colours.

Khadi can be cool
While the initial plan was to stock only khadi, Mini found that this was not economically viable. So she opted for all natural fabrics including cotton and silk. “We produce about 800 pieces a month now,” she says.
WEALTH FROM WASTE

Green Oil, Delhi
Anupam Jalote 46

Practice makes perfect
Anupam Jalote quit his job as senior vice-president at Bharti Airtel in 2008 to work on producing renewable energy and organic manure. He started Green Oil with wife Manta, 43, in 2010. The company is based in Delhi but they source the waste material from Jaipur.

Starting small
Green Oil produces organic manure and sells it on a small scale under the brand name of Green Oil Karsha. The company is in the process of building a 1 MW power plant—which will be connected to the National Grid—in Samode village, near Jaipur. “It is like a sophisticated gobar gas plant that uses waste to produce bio-methane through anaerobic digestion,” says Jalote. Rotten fruits and vegetables, cattle and elephant dung and other organic farming waste would be used to produce electricity. The company will also sell the by-product, organic manure.

Plant for the future
Jalote aims to build 10 power plants of 1 MW each in five years. The company’s current revenue is Rs 3 lakh-Rs 4 lakh a month. Last year, a Zurich-based company, IGT Venture Philanthropy, bought 30 per cent stake in Green Oil for $600,000 (Rs 3 crore). A lot rests on the Green Oil for $600,000 (Rs 3 crore). A lot rests on the Samode plant. Once it becomes operational, Jalote anticipates a monthly revenue of around Rs 1 million from the sale of power and organic manure.

"We want to help farmers profit from their farming waste and reduce their dependence on chemical manure."
ECO-FRIENDLY RESORT

The Tree House Resort, Jaipur

Sunil Mehta 55, Uttam Thahryamal 50,
Sudeep Mehta 28, Shrey Mehta 24

Spa with a difference

Eco-conscious siblings Shrey and Sudeep wanted to do something for trapped exotic birds that were kept in cages and sold in markets. In 2012, they launched Taruveda, an aviary eco spa at The Tree House Resort owned by their father Sunil Mehta and his friend Uttam Thahryamal on the Delhi-Jaipur highway. The caged birds are released into an aviary outside the glass-walled spa rooms. The resort is now home to 250 species of birds.

Organic appeal

Rainwater harvesting at The Tree House Resort has resulted in an increase in groundwater from 250 ft to 400 ft in just seven years. Employees are hired from local villages after extracting a promise from them not to fell trees or use wood for fuel. The use of organic products only adds to the appeal of the green resort.  by Rohit Parihar
CLAY COOLING

Mitti Cool clay products,
Wankaner, Gujarat
Mansukhlal Raghavjibhai Prajapati 48

Pottering around

In 2002, Prajapati launched Mitti Cool fridge, a clay refrigerator for the common man. It runs without electricity, keeps perishables fresh for seven days, water cold and milk and curd fresh for almost 24 hours. He is now working on the ‘Mitti Cool House’, a house that will keep itself cool without consuming any extra energy.

Cost quotient

At the top level of the Mitti Cool fridge is a storage chamber for 10 litres of water. The bottom compartments can hold 5-7 kg of vegetables, fruits and milk at 8-10°C below room temperature. Water poured into the chamber just beneath the top trickles down between its double-layered walls, extracting heat from within, and evaporates, leaving the chambers cool.

With an annual turnover of more than Rs 30 lakh, Prajapati has sold over 7,500 refrigerators. On every fridge priced at Rs 3,340, he earns a profit of Rs 400. He has now ventured online too.

“...I am inspired by the idea of innovation. I want to make eco-friendly products affordable for the poorest of poor...”

by Devika Chaturvedi
FEAT OF CLAY

Eco-friendly birdhouses, Ahmedabad

Damji Prajapati 58

Rumble in the concrete jungle
Prajapati has been making earthen birdhouses for the past 10 years to encourage people to protect the natural habitat of birds. “The use of steel and glass in our buildings has reduced the availability of nesting sites,” he says.

A helping hand
“All that birds need is some space around homes, which is possible by planting indigenous hedges or simply a nesting box,” he says. Many of his birdhouses, which cost upwards of Rs 250, are designed to be attached to a tree, building or pole.

Home with a difference
Prajapati’s birdhouses are textured in the form of a tree trunk. He has now received orders from real estate developers who plan to include it in their design schemes.

by Devika Chaturvedi

“I watch documentaries on birds that keep me updated about new technologies and informs me about innovations in this field.”
GREEN WASH

Krya Consumer Products, Chennai
Preethi Sukumaran 34 and
Srinivas Krishnaswamy 36

Healthy detergent
The Chennai-based duo were always eco-conscious. They started their own company, Krya Consumer Products, in 2011, which manufactures household products with natural ingredients that are high on the green quotient. Their first product was the Krya natural detergent powder that saves 25 litres of water per wash as compared to chemical detergents.

Value for money
The detergent is more expensive than regular ones, with a 400 gm box costing Rs 290. They average a sale of Rs 1 lakh a month.

by Banumathi K.
MANAGING WATER
Mazhapolima, Thrissur
Jos Raphael 48

Deepening crisis
Jos Raphael was a busy man, dividing his time between community irrigation projects among farmers in various states in India and work as a consultant to the International Water Management Institute in Colombo in 2004. That’s when he became aware of an acute water shortage in his hometown, Thrissur, in Kerala. Real estate sharks had filled up wetlands for construction and people were forced to depend on expensive water tankers for their daily needs. It was then that he came up with the idea of open-well recharging system.

Smart solution
His idea was a simple and inexpensive one, using PVC pipes and a filter. He installed the system on an experimental basis in some villages in 2002 and found that there was abundant water throughout summer in those places.

On a roll
The system was christened Mazhapolima (rain feast) and a Bangalore-based trust, ARCHYM, helped implement it across villages of Thrissur. The Kerala government gave him a Rs 5-lakh grant for the project.

“While Kerala gets a lot of rain during the monsoon, storage is an issue. I thought of designing a simple but practical mechanism to retain rainwater.”
Creating carbon sinks

In spite of being an oil and gas producing company, Oil and Natural Gas Corporation (ONGC) was one of 10 companies included in Newsweek’s 2012 list of green majors.

THE BIG IDEA A major initiative by the firm is creating carbon sinks through its afforestation programmes. It has planted 23 lakh mangroves near Gandhar and Hazira in Gujarat.

ENERGY SAVINGS A well-known initiative by ONGC is its Mokshdra Green Cremation System that is an environment-friendly way of reducing wood consumption of up to 40-50 per cent during cremations, thereby minimising air and water pollution.

Eco-friendly lending

Ever since its inception in 2004, Yes Bank, India’s fourth-largest bank, has made environmental consciousness its mandate. Much of its efforts lie behind the scenes.

THE BIG IDEA An important aspect of their environment and social policy is looking at companies the bank gives loans to. “We have a robust checklist of prohibitive activities that goes beyond the general credit analysis. We don’t lend to business that are unsustainable,” says Namita Vikas, president and chief sustainability officer at Yes Bank. Political advocacy is another important area of contribution for the bank. It has collaborated with TERI to publish research reports on topics such as electric vehicles, low carbon industrial growth, sustainable agriculture and green real estate.

ENERGY SAVINGS The bank has also taken concrete steps to reduce electricity usage in its branches and ATM centres. “We looked at locations that did not require signage and electricity 24 hours a day and created a cut-off time to switch off the electricity,” says Vikas. Electricity usage came down by 11,25,000 kilowatt and saw cost saving of Rs 2.5 crore.
GREEN GOLD
Uravu, Wayanad, Kerala
C. Surendranath

Rural inspiration
Surendranath left a career in mainstream journalism to set up an NGO, Uravu, in 1996 with the help of 15 other ecology enthusiasts from different walks of life. “The inspiration for setting up Uravu came from taking part in various social movements connected with protection of environment, livelihood issues of indigenous people and dangers posed by unbridled development,” says Surendranath.

Eco-friendly homes
Uravu focuses on making houses and handicrafts out of bamboo. “When we use bamboo for construction, it involves a wastage of 30 per cent but reduces the need for cement by 50 per cent, sand by 20 per cent and steel by 90 per cent,” says Surendranath. This helps reduce ecological degradation.
COOKING UP A STORM
First Energy, Pune
Mahesh Yagnaraman 48, Mukund Deogaonkar 47

Small beginnings
In 2006, Yagnaraman and Deogaonkar joined First Energy, a subsidiary of BP Energy, and a year later, they came up with Oorja biomass pellet stove in collaboration with Indian Institute of Science in Bangalore. They began by targeting households in villages and small towns, encouraging housewives to give up cooking by chulha. Each stove costs Rs 2,000-Rs 3,000 and pellets Rs 16-Rs 18 per kg.

Green quotient
A kilo of pellets equals 4 kg of wood. By eliminating wood as a fuel resource, the stove reduces pollution and deforestation. The pellets, made of agricultural residue like peanut husks, ensure that farmers don’t burn waste. First Energy parted ways with BP Energy in 2009 and tied up with Alchemists Ark, a privately held business consulting group.

by Suhani Singh

“’There was a huge gap for progressive energy solutions in the cooking segment and we ventured into it.”"
And while many people are motivated by their passion for the environment, others are driven to “go green” by the extensive benefits provided by sustainable structures, including:

1. **Saving energy** – A recent [Government Services Administration Study](https://www.eere.energy.gov/buildings/sher/pdfs/gsa-energy-conservation-research-paper.pdf) found that green buildings use 25% less energy and 11% less water than standard federal buildings.

3. **Increasing property value** – A study of green buildings in the U.S. and Canada found that a “green” designation can increase a building’s market value.

4. **Raising productivity** – According to the [Natural Resource Defense Council](https://www.nrdc.org/), eco-friendly amenities that make a building a healthier and more comfortable work place can reduce employee absenteeism and turnover while increasing productivity.

5. **Receiving financial rewards and staying under budget** – Numerous sources of [funding for green building](https://www.greentechmedia.com/) are available at the national, state and local levels for homeowners, industry builders, government organizations and nonprofits organization.
Greening the Telecom sector

- A significant % of India's diesel fuel consumption (3.5 billion liters) goes not to trucking but to electric generators being used specifically for powering cell phone towers.
- Almost 50 % of the current carbon footprint of the telecom sector of 11 million tons of CO₂ can be attributed to diesel.
- More than 60 % of the towers in India depend solely on diesel for power generation, According to two officials working for tower companies, approximately 15 % of the diesel bought is pilfered at some stage.
DoT expects 75% of rural towers and 33% of urban towers to become environment friendly by 2020.

ICT sector worldwide is responsible for around 0.7 per cent of global CO$_2$ emissions. The total emission of the telecom industry in India is around 1% of the country's total CO$_2$ emissions, which makes it poorer than the world's average in percentage terms. Carbon emissions and fuel consumption are only part of the larger issue.
Like other major issues related to the telecom industry, the sustainability of telecom companies has also come under the regulatory scanner. The government bodies are pulling out all the stops to ensure that Indian telecom becomes clean and green. Sustainability issues in the telecoms industry are driven by four key factors:

- Reduction of operational expenditure.
- Rapidly evolving legislation and regulation.
- Product creation and revenue development.
- Consumer preferences and predominance of the social dimension.
Indian telecom industry

The report claims that there is a return on investment to the tune of Rs. 13,000 crore for Indian telecom industry, if it phases out diesel completely and replaces it with renewable energy technologies by 2020. It suggests that the telecom operators should reduce their carbon emission by 40 percent, to enable effective transition to low carbon business model. It also suggests high, but logical carbon emission reduction target, for Indian telecom sector by 2020.
**Typical Solutions and best practices for Telecom Sector in India supporting GPS**

**Solar power:**
Under pressure from the general public and NGOs like Greenpeace, Trai mandated that 50% of rural and 20 per cent of urban sites must be retrofitted to be powered with renewable sources of energy by 2015. The tower industry has deployed about 3,000 pilot solar sites over the past few years. And with the recent increase in diesel prices, solar energy is becoming more and more viable.

"Every square metre of concentrated solar thermal collector can replace up to 200 litres of diesel annually. Unfortunately, most of the solar systems deployed have not achieved significant savings to justify a large scale deployment."
Battery power:
Companies will therefore need to look for new technologies to suit Indian conditions. For example, a research by Tata Strategic has shown from a survey that nearly 40% of telecom sites lack power for more than 12 hours a day on an average. So in such cases Indian telecom companies could leverage the best practices that companies such as Vodafone have implemented in using batteries for their towers and remote base stations.
Wind power:
Wind power is another possible alternative to diesel and solar power. Data from the ministry of new and renewable energy shows that wind power currently accounts for 75% of the renewable power generated in India.

India is 5th in the world in terms of installed wind power capacity. Tamil Nadu leads in wind power generation and it has the potential to erase its power deficit by harnessing wind power intelligently.
Fuel cells and hybrid vehicles; India is now becoming a tech hub with companies now bringing in smart technology. The Indian telecom industry should take a leaf out of the book of other industries like automobiles. For example, fuel-cell vehicles developed by Toyota can run 5 times longer than battery electric cars on a single power-up, and it takes just minutes to fill the tank with hydrogen, compared with eight hours or so to recharge a battery. Similarly, telecom companies can draw lessons from the European auto companies who use renewable for fuels and clean diesel.
Sharing technology:

By sharing infrastructure and moving to cloud based technologies telecom companies can save a considerable amount of emissions. For example, the telecom companies are already sharing their tower infrastructure.
Using ICT: The expenditure on ICT in the Indian telecom sector has gone up by nearly 14 per cent from the last year. According to Dhamodaran Ramakrisrinan of IBM, a smart power grid will allow utilities and consumers to reduce peak demand and help avert blackouts, and can be linked to thousands of power sources, including climate-friendly ones such as wind and solar. ICT solutions such as Hamesha On are now available that can help businesses monitor fluctuations, reduce pilferage and avert crises during peak loads.
The changing market dynamics forced Indian companies to tweak the way they do business. *They still import products from China, But they have also formed technology tie-ups with chip makers, set up design and research learns, and strengthened their distribution network.* These efforts have helped the top five Indian brands to increase their share of the total mobile phone industry revenue of Rs. 55,000 crore to about 14 per cent from three to four per cent in early 2011, according to industry estimates.
Sharma also streamlined operations and forged technology tie-ups with US-based chip maker Qualcomm and Taiwan's MediaTek. He brought in Ajay Sharma, former country head of Taiwanese phone maker IITC as the head of the smartphone division. Khaja Muzaffarulflah joined from Sony Ericsson as the head of feature phones, and Deepak Mehrolra from Bharti Airtel was hired as the group CEO, Micromax also started monitoring its dealer network closely to keep track of retail sales and have a better understanding of the inventory, says Sharma.
Laying Foundations for Energy Efficiency Revolution in India
80% SAVINGS* IN OPERATING COSTS
WITH GEOTHERMAL AIR CONDITIONING

**GIBSS Score Card:**
- INR 690 million savings in buildings across India
- 8 million electrical units per year (KWH)
- 77% in direct energy consumption
- 150 million litres of water consumption per year
- 9000 tonnes of carbon footprint equivalent to planting 5 lac fully grown trees
- 24120 labour hours per year

**GIBSS has won several accolades:**
- Winner of Parivartan Sustainability Leadership Awards 2012
- Winner of Indiafrica Fellowship supported by the Ministry of External Affairs, India
- One of the Winners of Samsung CNBC Innovation Quotient Season 2
- Sankalp 2012 award winner for the Most Innovative & Sustainable Company in 'The Clean Tech & Clean Energy Sector'
- Winner of TIE 2010

**Performance Bank Guarantee I Zero Initial Investment**
**Dedicated Inventories I Buy Back**
Going Green

Some companies are also outsourcing their corporate social responsibility (CSR) jobs to outside consultants. IndusInd Bank is one of several companies that have been working with the Centre for Environmental Research & Education (CERE) to reduce energy consumption by 15 per cent per annum. It currently has 100 solar-powered ATMs across India. Companies such as Apollo Tyres, Cisco and II&FS have also managed to reduce their energy consumption and increase employee productivity through green initiatives such as water recycling and construction of green buildings. "Being a manufacturing company, our engineers work on some of these initiatives, while for initiatives like carbon footprint analysis and reduction, we work with external agencies," says an Apollo Tyres spokesperson.
GREEN LIGHT
Job potential of the green business in India

GREEN BUILDINGS
100,000 professionals needed by 2025

RENEWABLE ENERGY BUSINESS
1,400,000 professionals needed by 2020

MORE IN THE OFFING
CII and Rockefeller Foundation's Speed* project

BIOMASS
Each pilot project will create
4 Direct jobs
10 Indirect jobs

SOLAR
Each pilot project will create
1 Direct job
3 Indirect jobs
Automobile sector in India towards green products and services

Two new launches in the past three months from General Motors India have made many auto analysts sit up and take notice. The compact Sail, sold as a sedan and hatchback, is on the market as the first model designed by GM's Chinese partner in India, Shanghai Automotive Industry Corporation. Waiting in the wings and about to be launched any day now is the multi-purpose vehicle Enjoy, which GM will introduce to lap into the fast-growing SUV segment.
Sales trend of GM India over the past six months

GM has seen some momentum in sales after the launch of the Sail U-va

Unit sales

- August: 6989
- September: 7396
- October: 6754
- November: 7230
- December: 7048
- January: 7588
Product sales of General Motors India (January 2013)

GM has a tiny share in the premium hatchback segment

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<tr>
<th>Model</th>
<th>Unit Sales</th>
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<td>Optra, Cruze</td>
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Over and above all the development in auto industry also centered towards environment friendly products. If the sustainable resource utilization is not adopted, the car will not be sold in India. Auto industry now encourage green products in its supply chain including the disposal of parts.
Indian Airports: A boost in green products and services

How much transformation the IGI Airport fit New Delhi has undergone - as compared to five years back - is nothing short of magic. No more queues standing under the sun, no more (lust blowing into the fares of passengers wailing for security checks, no heat, cold and rain. It was a change much needed, a big leap for India's airport sector. But we need 60-odd more such miracles in the next seven-eight years. Tough proposition.
Passenger traffic (million)
Why airport projects can't get delayed

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<td>2007-08</td>
<td>71</td>
<td>26</td>
<td>97</td>
</tr>
<tr>
<td>2011-12</td>
<td>106</td>
<td>38</td>
<td>144</td>
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<tr>
<td>2017-18</td>
<td>209</td>
<td>60</td>
<td>269</td>
</tr>
</tbody>
</table>
Today, this world's ninth-largest aviation market is in need of serious reforms in airport infrastructure. Indian Airports are huge market for green products and services which includes more than 5000 members of items these are vulnerable for the users who are observed to environment friendly situation.

Indian airports are huge market for green products and services which includes more than 5000 items those are vulnerable for the users who are obsessed to eco friendly systems in airport.
India is a huge market for green products and services for the players within the country or for the foreign players. India and Taiwan has good market relationship. Micro chip is one of the very important products that have transaction between these two countries. This is the time to explore the business potential and start bilateral transaction in this vulnerable area.
GREEN BUILDING
Green Building – Products

In the building industry, green construction celebrates a long history. Industry leaders had their eyes on the environment since long.

Today, green buildings and eco-friendly renovations are at the forefront of the design and construction industry in India.
In India the Green Building Code is now implemented and thus Green Product has huge market.

The Pearl Academy is sunk into the ground with air drawn into courtyards and cooled by water features. The air is drawn into the classrooms above which feature traditional screens to shade the building (The building is built using local stone and features traditional ideas such as covering the roof with earthenware pots to reduce heat absorption. These strategies add up to a temperature of 29ºC inside the building when it is 45ºC outside. The only air-conditioned areas are the library and dean’s office, and this is needed for just two months of the year. “A green building should not cost more - it should cost less and be cheaper to run,” The building will cost 10% more for a saving three years later is a hard sell.” The building costs 625/ft². A mechanically cooled building would have cost nearly double due to all the HVAC equipment, back-up power, high-performance glazing and insulation.)
**DEFINITION**

- **Green building** (also known as **green construction** or **sustainable building**) refers to a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from sitting to design, construction, operation, maintenance, renovation, and demolition. This requires close cooperation of the design team, the architects, the engineers, and the client at all project stages. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.

- Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:
  - Efficiently using energy, water, and other resources
  - Protecting occupant health and improving employee productivity
  - Reducing waste, pollution and environmental degradation
CONCEPTUAL DRAWING

- Photovoltaic generation
- Rooftop planting
- Improving insulation
- Automated ventilation control
- Lighting control using natural light
- Lighting control using motion detection sensors
- High-efficiency light fixtures
- Rainwater utilization systems
- High-efficiency heating equipment

Conceptual Drawing of Green Building
A green building is a structure that is environmentally responsible and resource-efficient throughout its life-cycle. These objectives expand and complement the classical building design concerns of economy, utility, durability, and comfort.
How Homes Become Green

Green Building with Heartland Builders, LLC.

www.heartlandbuilders.com

Exposure to the sun: Consider your home’s orientation to the sun to harness energy or to shield it from heat and UV light.

Other Considerations – Low VOC paints, "green" flooring, energy efficient lighting. Conduct a “blower door” test on your home to determine performance.

Insulation: Air sealing a home, using a blown insulation and minimizing thermal bridging lowers utility bills. Consider SIPs or ICF’s.

Recycled Deck Materials: Utilize sustainable resources and reduce maintenance costs.

Recycled Framing Materials: Such as finger jointed studs and an I joist floor system help reduce new lumber use.

Insulated Foundation Walls: Improves the comfort of your home and reduces utility costs. Consider ICF’s.

Insulated Basement Floors: Helps eliminate dampness and reduces utility costs.

High Efficiency Mechanical Systems: Reduce your energy bills. Consider a Geothermal Heating System. Always seal your duct work.

Energy Efficient Appliances: Reduce utility costs.

Conserve Water: With dual-flush toilets, water saving faucets and rain sensors for lawn sprinkling.

Native Landscaping: Requires less maintenance and irrigation.

Rain Gardens: Help reduce storm water run off.

High Efficiency Low E: Insulated glass windows reduce energy use and protect your home’s interior.
BENEFITS OF GREEN BUILDING

- Buildings have an enormous impact on the environment, human health, and the economy. The successful adoption of green building strategies can maximize both the economic and environmental performance of buildings.
• Enhance and protect biodiversity and ecosystems
• Improve air and water quality
• Reduce waste streams
• Conserve and restore natural resources
Economic Benefits

- Reduce operating costs
- Create, expand, and shape markets for green product and services
- Improve occupant productivity
- Optimize life-cycle economic performance

Social benefits

- Enhance occupant comfort and health
- Heighten aesthetic qualities
- Minimize strain on local infrastructure
- Improve overall quality of life
How do buildings affect climate change?

- The energy used to heat and power our buildings leads to the consumption of large amounts of energy, mainly from burning fossil fuels - oil, natural gas and coal - which generate significant amounts of carbon dioxide (CO2), the most widespread greenhouse gas. Buildings in the U.S. contribute 38.1 percent of the nation's total carbon dioxide emissions.
There are many energy efficient buildings in India, situated in a variety of climatic zones. One of these is RMZ Millenia Park, Chennai, India's largest LEED gold-rated Core & Shell green building.

Indian Green Building Council, formed by Confederation of Indian Industry (CII) in the year 2001, is continuously striving towards wider adoption of eco-friendly / green building concepts in the Indian Industry. IGBC promotes a whole-building approach to sustainability, based on the principles of 5 elements of nature [the Panchabutas viz. earth, water, fire(energy), air & sky] by recognizing performance in the following five key areas.
KEY AREAS

- Sustainable site development
- Water savings
- Energy efficiency
- Materials selection
- Indoor environmental quality
- Triggering off the Green building movement in India is the first Platinum Green Building in India; CII-Sohrabji Godrej Green Business Centre in Hyderabad as per the LEED (Leadership in Energy and Environmental Design) Rating system. This landmark achievement put India on the global map of green building movement, through support of all stakeholders from the construction industry. With a modest beginning of 20,000 sq ft (1,900 m²) green built-up area in the country in the year 2003, as on date, 1,724 projects in India have registered under the IGBC Rating programmes, with a total footprint of over 1.2 billion sq. ft. These developments include various kinds of buildings like: Corporate offices, Hotels, Hospitals, Airports, IT Parks, SEZs, Townships, Gated Communities, Residential Buildings, Government Offices, Schools, Colleges etc.
FACTS AND NUMBERS

- Today, India has 267 certified green buildings, which are fully functional and operational.
- IGBC has launched different rating programmes to suit variety of building types.
  - **IGBC Green Homes Version 2**: This rating system is designed for rating new residential buildings, such as Individual homes, Gated communities and High rise residential apartments, etc.,
  - **IGBC Green Factory Building**: This rating system is designed for new & existing factory buildings, such as manufacturing facilities, etc.,
  - **IGBC Green SEZs**: This rating system is designed for Special Economic Zones (SEZ). The rating meets the guidelines of Ministry of Commerce & Industry (MoCI).
  - **IGBC Green Townships**: This rating system is designed for rating integrated township developments
FACTS AND NUMBERS

LEED 2011 for India-New Construction: This rating system is applicable for those buildings where the design and operation is fully in the scope and control of owner or the developer, such as, Corporate office, Institutional building, etc.,

LEED 2011 for India-Core & Shell: This rating system can be used for projects where the developer controls the design and construction of the entire core and shell base building including MEP/FP systems, but has no control over the design and construction of the tenant fit-out. Such type of developments include: Retail Malls, IT Parks, etc.

The council, now in its 10th year of operation, has crossed significant milestones, as highlighted below:

- Over 1 billion sq ft (built up space) of registered green buildings in India
- Over 1,300 strong IGBC member organizations
- Organizing Green Building Congress - India’s annual flagship event on green building, since 2001.
BEE Certification

- The Indian Bureau of Energy Efficiency (BEE) had launched the Energy Conservation Building Code (ECBC). The code is set for energy efficiency standards for design and construction with any building of minimum conditioned area of 1000 Sq mts and a connected demand of power of 500 KW or 600 KVA. The energy performance index of the code is set from 90 kW·h/sqm/year to 200 kW·h/sqm/year where any buildings that fall under the index can be termed as "ECBC Compliant Building".

- More over the BEE had launched a 5 star rating scheme for office buildings operated only in the day time in 3 climatic zones, composite, hot dry, warm humid on 25 February 2009. IGBC rated green buildings are also able to meet or exceed the ECBC compliance. The CII Sohrabji Godrej Green Business Centre is a BEE 5 star rated building.

- The Reserve Bank of India's buildings in Delhi, Bhubaneshwar in Orissa and in Kerala have been star rated.

- In Tamil Nadu 11 buildings were star rated by BEE, in the year 2010, including RBI buildings.
Traditional buildings in India

- Traditional buildings were energy efficient. This was because architecture depended on the places. Buildings in the hot and dry regions, had corridors directing the wind to cool naturally. In wet regions, structures using natural light and breeze, were used. Some examples are:
- Hawa Mahal - Articulated windows provides cool breeze in a desert area
- Golkonda - Ventilation is designed to let in fresh cool breeze, in spite of summer.
- The traditional building practices were utilized in constructing the Dhyanalinga. Mud mortar stabilized with lime, sand, alum and some herbal additives was used.
GREEN COMPUTING
DEFINITION

- The positive (or least negative) relationship between the physical computer and its impact to the environments in which it moves through from cradle to grave.

- Green computing is the environmentally responsible use of computers and related resources. Such practices include the implementation of energy-efficient central processing units (CPUs), servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (e-waste).
Green Computing - Why?

- Computer energy is often wasteful
  - Leaving the computer on when not in use (CPU and fan consume power, screen savers consume power)

- Printing is often wasteful
  - How many of you print out your emails or meeting agendas
  - Printing out partial drafts
  - For a “paperless” society, we tend to use more paper today than before computer-prevalence

- Pollution
  - Manufacturing techniques
  - Packaging
  - Disposal of computers and components

- Toxicity
  - As we will see, there are toxic chemicals used in the manufacturing of computers and components which can enter the food chain and water!
REducing Energy Consumption

- Turn off the computer when not in use, even if just for an hour
- Turn off the monitor when not in use (as opposed to running a screen saver)
- Use power saver mode
  - in power saver mode, the top item is not necessary, but screen savers use as much electricity as any normal processing, and the screen saver is not necessary on a flat panel display
- Use hardware/software with the Energy Star label
  - Energy Star is a “seal of approval” by the Energy Star organization of the government (the EPA)
- Don’t print unless necessary and you are ready
- Use LCDs instead of CRTs as they are more power efficient
Microchip fabrication has over 400 distinct steps which involve 4 general phases:

- **Layering**: Application of a thin layer of desired material, usually silicon or aluminum.
- **Oxidation**: Changes a semi-conducting silicon layer into a insulating silicon dioxide layer.
- **Patterning**: Carving of a dense, maze-like set of furrows into a layer.
- **Etching**: Use of solvents or particle bombardment to alter the layer patterns.

Throughout the process, a great deal of ultra-pure water and the chips are bathed in chemical solvents.

<table>
<thead>
<tr>
<th>Component</th>
<th>Fossil Fuels (kg)</th>
<th>Chemicals (kg)</th>
<th>Water (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Chips</td>
<td>94</td>
<td>7.1</td>
<td>310</td>
</tr>
<tr>
<td>Printed Circuit Boards</td>
<td>14</td>
<td>14</td>
<td>780</td>
</tr>
<tr>
<td>CRT monitors</td>
<td>31.5</td>
<td>0.49</td>
<td>450</td>
</tr>
<tr>
<td>LCD monitors</td>
<td>226</td>
<td>3.7</td>
<td>1290</td>
</tr>
</tbody>
</table>
CRT - lead and zinc leachate mean monitors are hazardous waste (Lee et al., 2004)
- Lead: bio-available in soil - can attack proteins and DNA, as well as interfere with nervous system function (Bechara, 2004; Needleman, 2004)

LCD - 4-12 mg mercury /unit (Williams, 2003)

Liquid crystals - polycyclic or halogenated aromatic hydrocarbons, 588 different compounds
- 4% have potential for acute toxicity, but show no mutagenic effects in bacteria tests (Williams, 2003)
PBDE – similar structures to PCB and DDT
  - Bio-available, environmentally persistent, biomagnifies in blood, fatty and liver tissue (Domingo, 2004)

Extraction impacts – refining of petroleum for energy and plastic, mining and smelting of metals

Solvents in microchip fabrication – hydrochloric acid, hydrofluoric acid, arsenic, benzene and hexavalent chromium (Williams, 2003)
Chemical Elements Used: Mercury

- Mercury is used in
  - batteries, switches, housing, printed circuit boards
  - mercury is found in medical equipment, data transmission equipment, telecommunications equipment and cell phones as well
  - it is estimated that 22% of the yearly use of mercury is in electrical and electronic equipment
    - although a small amount of mercury is used, it is used in nearly all computer construction amounting to 400,000 pounds of mercury used between 1997 and 2004

- The problem
  - mercury spreads out in water transforming into methylated mercury which easily accumulates in living organisms
  - it enters the food chain through fish that swim in polluted waters
  - methylated mercury can cause chronic brain damage
Cadmium is used in resistors for chips, infrared detectors and in semiconductors (plus older CRTs)
- estimated that between 1997 and 2004, 2 million pounds of cadmium was used in computer components

The problem:
- cadmium is classified as toxic, these compounds accumulate in the human body, particularly the kidneys
- cadmium is absorbed through respiration and also food intake
- cadmium has a half life of 30 years so that cadmium can poison a human body slowly through the human’s life

Hexavalent Chromium (Chromium VI) is used to treat steel plates (an anti-corrosive) and it is estimated that between 1997 and 2004, 1.2 million pounds were used in computer components
- if you’ve seen Erin Brokovich, you know that this can lead to cancer and a number of other medical problems
Chemical Elements Found in Computers and Components

- Elements in bulk: lead, tin, copper, silicon, carbon, iron and aluminum
- Elements in small amounts: cadmium and mercury
- Elements in trace amounts:
  - germanium, gallium, barium, nickel, tantalum, indium, vanadium, terbium, beryllium, gold, europium, titanium, ruthenium, cobalt, palladium, manganese, silver, antimony, bismuth, selenium, niobium, yttrium, rhodium, platinum, arsenic, lithium, boron, americium
- List of examples of devices containing these elements
  - almost all electronics contain lead & tin (as solder) and copper (as wire & PCB tracks), though the use of lead-free solder is now spreading rapidly
  - lead: solder, CRT monitors (Lead in glass), Lead-acid battery
Short product life expectancy (2-4 years)

Same toxins in manufacturing process can cause environmental contamination

Human health risks

Lead, barium, chromium, CNS disruptors etc. (Baul, 2002)

Human rights problems – “Exporting harm”
OTHER SOLUTIONS

 Reuse: donate your computer components to people who may not have or have lesser quality computers
  - inner city schools, churches, libraries, third world countries
    - this however leads to the older computers being dumped but there is probably no way around this as eventually the older computers would be discarded anyway
 Refurbish: rather than discarding your computer when the next generation is released, just get a new CPU and memory chips – upgrade rather than replace
  - while you will still be discarded some components, you will retain most of the computer system (e.g., monitor, the system unit housing, cables)
If companies can recycle the plastics and other components, this can greatly reduce waste and toxins
- however, the hazardous materials in e-waste can harm the recycle workers if they are not properly protected
  - in undeveloped countries, a lot of the recycling chores are left up to unprotected children!

Developed countries now have facilities for recycling e-waste
- however, in Europe, the plastics are discarded instead of recycled because the flame retardant chemicals are too toxic to work with

To resolve these problems, the computer manufacturers must start using recyclable chemicals
GREEN CARS
DEFINITION

- **Green Vehicles (GV)** is a technology company that has developed a substantially lower cost, longer range, higher powered, **advanced propulsion system**.

- GV’s lithium-ion powered advanced propulsion system delivers **40% longer battery life**, **30% greater distance** (up to **100 miles** on a single charge) & **greater power** (speeds of up to **85 mph**), at a **greatly reduced cost** versus its competitors.

- GV is positioned to become a vital supplier of **advanced battery electric propulsion systems** to major automobile manufacturers rushing to fill the surging demand for BEVs & plug-in hybrid electric vehicles (PHEVs).

- To achieve immediate and significant market penetration in advance of wide adoption by major automobile manufacturers, GV has implemented its advanced propulsion systems into its **own line of BEVs**, which are **in production and for sale now**, starting at **under $24,000**.

- GV’s **strategic relationships** with Silicon Valley Power, Stanford University’s Rapid Prototyping Laboratory, Mobius Power, Coulomb Technologies and other leading technology innovators position GV to **retain its leadership in the industry’s rapidly developing areas**.
The Challenge of Greening a Growing Global Vehicle Fleet

- Three Major Issues
- Air Quality
- Energy Security
- Climate Change
The Challenge – Electric Propulsion

- Electric propulsion systems used to power a hybrid electric vehicle (HEV) such as the Toyota Prius differ substantially from what is necessary for a PHEV or a BEV.
- Transition to lithium-ion battery modules, high power charging systems, and efficient high-speed motors and controllers requires experience, development, and testing.
- Currently no such electric drive solutions available for under $40,000.
- Green Vehicles is positioned to be first-to-market making advanced EVs affordable with lithium-ion.
- Our solution balances power, range, usability, and cost.
Products - Triac

- **Triac Freeway Commuter** Vehicle - $24,995 (freeway commuting with HOV lane access and 2 passenger side-by-side seating)

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Upgrade Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Motor &amp; Controller</td>
<td>(standard)</td>
<td>30kW</td>
</tr>
<tr>
<td>AC Motor &amp; Controller</td>
<td>(upgrade)</td>
<td>60kW</td>
</tr>
<tr>
<td>Batteries</td>
<td>(standard)</td>
<td>23kWh LiFePO4 - 100 mile range</td>
</tr>
<tr>
<td>Batteries</td>
<td>(upgrade)</td>
<td>26kWh LiFePO4 - 120 mile range</td>
</tr>
<tr>
<td>Charger</td>
<td>(standard)</td>
<td>6kW charger for use with 120V or 240V outlet</td>
</tr>
<tr>
<td>Battery Management System</td>
<td>(standard)</td>
<td>Monitors, controls and displays individual battery voltages. Programmable through color touch screen interface. USB port access to vehicle data memory. Optional balancing.</td>
</tr>
</tbody>
</table>

Top Speed: 85 mph

Safety Features:
Structural steel cage, Frontal Impact Redirection, Side Impact Bracing, Low Center of Gravity
Meets or exceeds NHTSA’s FMVSS
Industry Technology Trends

- **Energy Storage**
  - Li-Ion next generation
  - Ultra capacitors
  - Breakthrough technologies

- **SMART Grid**
  - J1772
  - Charger infrastructure
  - PUCs

- **Efficiency/Reliability Improvements**
  - System level
  - Component level
  - Manufacturing level

- **Intelligent/Modular Systems**
  - Variability through software

- **IT System**
  - Customer value added over conventional cars
The Solution – Green Vehicles' Core Technology Development

- **Intelligent Regenerative Braking** that dynamically adapts to driving conditions (e.g., urban vs. highway) to recover kinetic energy wasted in conventional braking systems.

- **Advanced Battery Management System (BMS)** that capitalizes on temperature-based cell charge analysis to provide “dynamic full-point” charging and extend battery life by 40% over current voltage-based charge equalization devices.

- **“Smart-Grid” Chargers/Charging Infrastructure** based on emerging smart-grid standard (SAE J1772 - full 19kW capability) in order to enable electric vehicles to both charge and supply power to electrical grid.

- **X Battery** On-going evaluation of breakthrough energy storage technology through close strategic partnerships. Next generation energy storage solutions are enriching the parameters.

- **Hub Motors** that are located on each wheel rather than a single central motor in order to reduce motor costs by 35% and provide 20% more usable vehicle space. Control systems provide advanced traction advantages.
The Solution – Green Vehicles' Technology

• Green Vehicles is using technical innovation to optimize both performance and cost

**EV Benefits**
- Extend Electric Vehicle Range
- Extend Lithium-Ion Battery Life
- Reduce Motor Cost
- Provide More Usable Vehicle Space
- Driver Feedback/Training
GHG Reduction

• How to reach 1990 GHG emission levels by 2020...

• Using an estimated reduction of 250 grams per mile
• “well-to-wheels” in CA, gives 3.2 tons GHG per year per vehicle replaced.

• Creation of a new niche demonstrating the utility of a regional vehicle

• SMART grid acceleration through Silicon Valley Power

• Grow a component supply-chain and EV technology development critical mass centered in California

• By 2020, GV is targeting a combined vehicle and electric propulsion systems market penetration of 2.5% of new cars

Cost Analysis based on driving 35 miles per day

<table>
<thead>
<tr>
<th>Make/Model</th>
<th>Price</th>
<th>MPG</th>
<th>Gallons/year</th>
<th>Yearly Cost of Gas, $</th>
<th>$2.25/gal</th>
<th>$4/gal</th>
<th>GHG (t/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Pickup Truck</td>
<td>$29,210</td>
<td>17</td>
<td>751</td>
<td>$1,376</td>
<td>$2.25</td>
<td>$4</td>
<td>9.2</td>
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<tr>
<td>Nissan Versa</td>
<td>$14,075</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyundai Accent</td>
<td>$15,150</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chevrolet Aveo</td>
<td>$14,000</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honda Civic</td>
<td>$15,910</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Gas Engine</td>
<td>$14,300</td>
<td>28</td>
<td>45%</td>
<td>$1,161</td>
<td>$2.25</td>
<td>$4</td>
<td>6.3</td>
</tr>
<tr>
<td>Honda Civic HEV</td>
<td>$34,710</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toyota Prius HEV</td>
<td>$33,800</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>Average HEV</td>
<td>$29,950</td>
<td>81</td>
<td>31%</td>
<td>$729</td>
<td>$2.25</td>
<td>$4</td>
<td></td>
</tr>
</tbody>
</table>

Yearly Cost of Electricity based on Time of Use Rates for Peak & OH Peak

<table>
<thead>
<tr>
<th>Make/Model</th>
<th>Price</th>
<th>Energy Range</th>
<th>$0.1/KWh</th>
<th>$0.1/KWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEV</td>
<td></td>
<td>7.5 KWh</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Miles EV (60/90)</td>
<td>$14,000</td>
<td>60 KWh</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>Average NEV</td>
<td></td>
<td>8.1 KWh</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>DH Mosoco</td>
<td></td>
<td>1.4 KWh</td>
<td>60</td>
<td>58</td>
</tr>
<tr>
<td>DH Tread</td>
<td></td>
<td>2.0 KWh</td>
<td>110</td>
<td>107</td>
</tr>
<tr>
<td>DH Backshot</td>
<td></td>
<td>1.5 KWh</td>
<td>85</td>
<td>83</td>
</tr>
</tbody>
</table>

Supplemental Yearly maintenance costs, Gas/Auto | HEV | PHEV | EV |
| Gas/Auto | HEV | PHEV | EV |
| Oil change Filter | $50 | $0 | $0 |
| Brakes | $50 | $0 | $0 |
| Tune-up | $30 | $0 | $0 |
| Transmission service | $30 | $0 | $0 |
| Rims, tires, etc. | $100 | $0 | $0 |
| Batteries | $0 | $0 | $0 |
| Total | $713 | $958 | $455 |

Average Total Maintenance and Fuel Cost @ $3.5/gal and $0.09/KWh:

<table>
<thead>
<tr>
<th>Make/Model</th>
<th>Gas Subcompact</th>
<th>Gas Truck</th>
<th>HEV</th>
<th>Mosco</th>
<th>Backshot</th>
<th>Trac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Year</td>
<td>$2,079</td>
<td>$1,965</td>
<td>$1,693</td>
<td>$781</td>
<td>$1,065</td>
<td>$1,030</td>
</tr>
<tr>
<td>Per Mile</td>
<td>$0.015</td>
<td>$0.015</td>
<td>$0.015</td>
<td>$0.015</td>
<td>$0.015</td>
<td>$0.015</td>
</tr>
</tbody>
</table>

Total Cost of Ownership Per Year @ Price (Assumed over 5 years; net Fed/CA rebate): Gas Subcompact | Gas Truck | HEV | Mosco | Backshot | Trac |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$5,285</td>
<td>$6,887</td>
<td>$6,111</td>
<td>$3,943</td>
<td>$5,001</td>
<td>$5,218</td>
</tr>
</tbody>
</table>

*Source: Consumer Reports 2008 Midsize 2009
Production

**Production**

2009
Initial production 12-15

2010
25 vehicles per month 25-50

2011
75-200 vehicles per month 35-70

2012
500+ vehicles per month 75+

*Assumes $5.5 million investment

**Excluding outsourced jobs

GV is an American manufacturer of EVs with U.S. WMI

Light manufacturing, assembly, fabrication, and test in San Jose, CA.

“Made in USA” > 60% of total value
Vehicle Emission Standards Are Making Cars Greener

[Graph showing gasoline vehicle emissions standards over time for U.S., European, and Japanese standards. The graph plots Hydrocarbons + Oxides of Nitrogen (g/km) on the y-axis and years (1970, 1980, 1990, 2000, 2010) on the x-axis.]
Toxic Emissions are Reducing

Level of noxious emissions from motor vehicles

Index, 1950s = 100


NOx, CO, VOC
Delinking Toxic Emissions from Vehicle Use

- Average Per-Vehicle Emissions (grams hydrocarbons per mile)
- Vehicle Miles Traveled (in billions)
Cleaner Cars Need Greener Fuels

- To reduce automobile toxic emissions it is not enough to rely only on cleaner engine technologies. It is also vital to ensure that cleaner fuels are used so that the vehicle as a total system can reduce its toxic emissions.

- For example catalyst systems greatly reduce toxic emissions but require both unleaded and low sulphur fuel. Global fuel sulphur levels of less than 50ppm is vital to make cars greener. The FIA Foundation is proud to support the global campaigns of UNEP’s Partnership for Clean Fuels and Vehicles to achieve a total ban on unleaded fuel and progress towards worldwide use of low sulphur fuels.
Towards Greener Motoring

- The FIA last year adopted ‘Make Cars Green’ a Declaration on ‘Air Quality, Climate Change and Automotive Fuel Economy’ which promotes a global agenda of action for greener motoring.
- It encourages automobile clubs to support:
  - Cost effective and equitable policies to curb GHG and toxic emissions
  - Stringent emission standards for both vehicle and fuel technologies
  - A global benchmark to promote fuel economy worldwide
  - A global test cycle for vehicle emissions that better reflects real world driving
  - A global target for low sulphur fuels
  - Eco-driving campaigns
  - Green taxation that incentives rather than penalises the motorist
  - Information campaigns to raise consumer awareness of ‘green mobility’ choices
  - A ‘ten point’ greener motoring guide
Conclusion

India is a huge market for green products and services for the players within the country or for the foreign players. India and Taiwan has good market relationship. Micro chip is one of the very important products that have transaction between these two countries. This is the time to explore the business potential and start bilateral transaction in this vulnerable area.
Best wishes from Prof Sadhan K Ghosh, Thank you

Taiwan - India Friendship collaboration live long